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RELATIVE EFFECTS OF CALCIUM AND ACIDITY OF THE SOIL ON THE OCCURRENCE OF POTATO SCAB

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In the course of a potato scab survey in New York State (Blodgett and Howe, 1934), many apparently exceptional cases of the occurrence of potato scab were found. In general, the occurrence of this disease seemed to be related to the hydrogen-ion concentration of the soil but numerous cases were found, particularly on the more alkaline soils, where there was either more or less scab than was expected on this basis. Certain other factors such as temperature (Dippenaar, 1933; Jones et al, 1922; Sanford, 1925) and soil moisture (Dippenaar, 1933; Martin, 1923; Sanford, 1925) have been shown to be of importance but these are not believed to account for all the variations found.

Accordingly, a number of preliminary experiments were started in the greenhouse with the purpose of discovering some of the other influences on the occurrence of potato scab. It seemed desirable, also, to check on the relation of pH to scab under more uniform soil conditions, particularly in the more alkaline range.

Effect of Increasing Alkalinity of Soil with and without the Addition of Calcium Compounds

An acid soil (pH about 4.48) was used. The effect of adding calcium in forms (hydroxide and carbonate) that would increase the pH of the soil was tried in comparison with a form (sulfate) which would not. In addition, using the same soil, a comparison was made between lots in which the alkalinity was increased by the use of a calcium compound and those in which the adjustment was made with sodium carbonate with and without calcium sulfate. In other words, the experiment was designed to indicate whether the amount of cal-

cium had any effect on scab other than through its effect on the alkalinity of the soil.

Each treatment was made on four pots of steam sterilized soil in which four successive crops of potatoes were grown at a relatively high temperature (about 70° F.). The soil was Volusia gravelly silt loam which had not been cropped or fertilized for twenty-five years. This soil was selected because of its low pH and low lime content. All except one series of pots were inoculated with a scab strain (7-p) which was isolated from potatoes and had proven to be pathogenic. The inoculum was added to the soil as cultures of the organism grown on steamed wheat. An equal amount of sterile steamed wheat (equal to 50 grams of dry wheat) was added to each of the pots of the uninoculated series. Green Mountain seed treated by the cold formaldehyde method was used in all these tests.

The experiment consisted of eight treatments of four pots, each containing about 3000 grams of soil and the treatments were as follows:

1. Soil and sterile wheat only.
2. Soil and inoculum plus 50 grams calcium oxide.
3. Soil and inoculum plus 20 grams calcium oxide.
4. Soil and inoculum only.
5. Soil and inoculum plus 48.5 grams calcium sulfate and 11.3 grams of sodium carbonate.
6. Soil and inoculum plus 11.3 grams of sodium carbonate.
7. Soil and inoculum plus 48.5 grams calcium sulfate.
8. Soil and inoculum plus 35 grams calcium carbonate.

Hydrogen-ion determinations were made with a quinhydrone electrode from a composite sample from the 4 pots of each treatment at the time each crop was dug. The pH's of the soil for the different treatments have been plotted (fig. 1) for the different harvest dates. The first crop was grown in glazed crocks and then the soil was transferred to flower pots and used for growing three additional crops. Higher pH readings were obtained in each series after the soil had been transferred to the more porous flower pots but the separate crops of potatoes were too small to allow positive judgment as to the effect of this change on the scab organism. The results of the four series have been tabulated together to obtain as large numbers for each treatment as possible but even then the total number of tubers from each treatment is small because of the small crops obtained under greenhouse conditions.

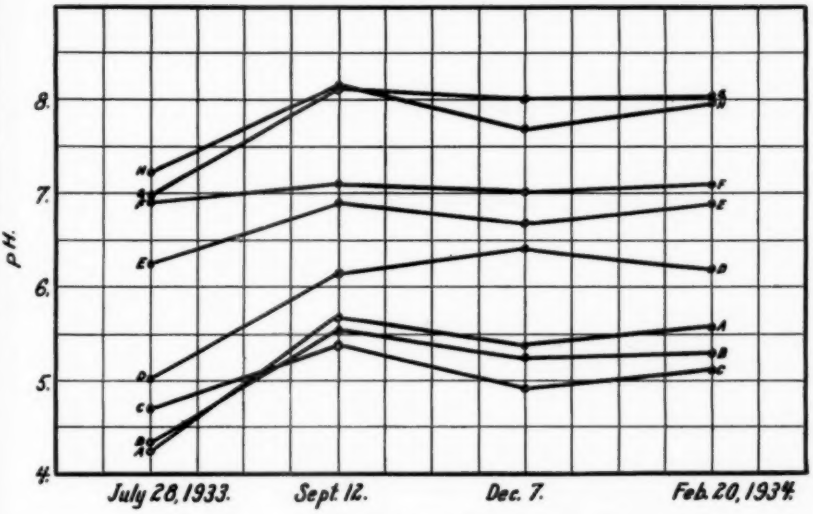

FIGURE 1.—*Average pH of soil, on various digging dates when treated as follows:*

A-A = Inoculum only. B-B = untreated. C-C = 48.5 grams of calcium sulfate plus inoculum. D-D = 48.5 grams of calcium sulfate plus 11.3 *grams of sodium carbonate plus inoculum. E-E = 20.0 grams of calcium oxide plus inoculum. F-F = 11.3 grams of sodium carbonate plus inoculum. G-G = 35.0 grams carbonate plus inoculum. H-H = 50.0 grams of calcium oxide plus inoculum.*

A summary of the results, showing the total number and percentage (table 1) of tubers in classes according to severity of infection indicates that the inoculum added, and the acidity recorded in terms of pH account for most of the variations in scab obtained. Both calcium oxide and calcium carbonate increased the amount of scab even at the largest amount applied which had been intended to be sufficient so that a decrease in scab might be obtained. The 48.5 grams of calcium sulfate, which supplied as much calcium as 20 grams of calcium oxide or 35 grams of calcium carbonate, not only did not cause an increase in the amount of scab but apparently caused a decrease below that in pots to which inoculum only was added without any calcium. This decrease is of doubtful significance, but it seems to correspond with the slightly lower pH of the soil so treated. The only treatments in which the scab results do not correspond well with the effect of the treatments on the acidity of the soil were those in which sodium carbonate was used to increase the alkalinity of the soil and especially where this material was used alone. This treatment increased the pH of the soil about the same as the 20 grams of calcium oxide but gave crops which had 20 per cent more clean potatoes. This may be due

TABLE 1.—*Numbers of clean and scabby tubers, and percentage of scabby tubers harvested from pots containing the specified amounts of chemicals and about 3000 grams of soil per pot*

	Untreated Uninfested	50 Grams CaO Plus Inoculum	20 Grams CaO Plus Inoculum	Inoculum Only	48.5 Grams $CaSO_4$ Plus 11.3 Grams Na_2CO_3 Plus Inoculum	11.3 Grams Na_2CO_3 Plus Inoculum	48.5 Grams $CaSO_4$ Plus Inoculum	35 Grams $CaCO_3$ Plus Inoculum
Number of clean tubers.	44	0	1	5	6	9	23	2
Number of scabby tubers	7	56	54	27	41	32	21	63
Total number of tubers..	51	56	55	32	47	41	44	65
Percentage of scabby tubers	13.7±4.8	100.0	98.2±5.7	84.4±6.4	87.2±4.9	78.0±6.5	47.7±7.6	96.9±6.8

Differences in numbers of clean tubers of 21.9 are probably significant.
Differences in numbers of scabby tubers of 19.2 are probably significant.

to toxicity of the sodium for the scab organism which is partly neutralized by the calcium when the sodium carbonate and calcium sulfate are applied together.

In general this test has failed to show that calcium compounds have any effect on potato scab aside from the indirect effect on the acidity of the soil and possibly neutralizing a toxic effect of the sodium carbonate.

The Relation of pH to Scab

Another point which was observed in the course of the survey mentioned above was that the scab increased with increased alkalinity of the soil to approximately pH 6.6 but as the alkalinity was increased beyond this point there was a tendency for the scab to decrease. This relation was presented more precisely in the form of curves (Blodgett and Howe, 1934).

In the acid range

In an attempt to verify this relation a series of experiments was conducted in our greenhouses. Each treatment included four pots of soil in which 3 successive crops of potatoes were grown at a temperature of approximately 70° F. The soil was Dunkirk fine sandy loam. All pots were sterilized and inoculated with a scab strain (T16) which was isolated from potatoes and has proven to be pathogenic. The inoculum was added as described previously.

The experiment consisted of ten treatments of four pots each containing about 3000 grams of soil and the treatments were as follows:

1. Soil and inoculum plus 50 cc. N/1 Na_2CO_3.
2. " " " " 15 cc. "
3. " " " " 3.5 cc. "
4. " " " " 3.5 cc. 2N H_2SO_4.
5. " " " " 15 cc. "
6. " " " " 30 cc. "
7. " " " " 40 cc. "
8. " " " " 60 cc. "
9. " " " " 90 cc. "
10. " " " " 120 cc. "

The amount of chemicals added was determined by titration of the original soil and an attempt was made to get a range of soils with pH's from 4.0 to 8.5. Using a quinhydrone electrode, hydrogen-ion determinations were made of a composite sample from the four pots of each treatment at the time the first two crops were dug. The ex-

tremes of the desired range were not obtained in this test perhaps because of the effect of the organism added to the soil. Sanford (1925) and Waksman (1920) have shown that these organisms have a tendency to change the soils toward a neutral reaction, a more favorable condition for their growth. Whatever the reason, the tendency of the acidity change in the series was in accord with their observations. The range obtained was from pH 4.71 to pH 7.39.

The results (table 2) show that over the range covered there is a positive correlation between the pH of the soil and the percentage of

TABLE 2.—*Showing average pH and numbers of clean and scabby tubers with percentage of scabby tubers for each treatment*

Treatment number	1	2	3	4	5	6	7	8	9	10
ph	7.39	6.62	6.44	6.51	6.4	5.95	5.95	5.63	5.07	4.71
Number clean ...	12	10	17	13	33	36	35	45	33	31
Number scabby ..	34	16	16	29	26	10	26	18	14	11
Total number ...	46	26	33	42	59	46	61	63	47	42
Percentage scabby	73.9	61.5	48.5	69.0	44.1	21.7	42.6	28.6	29.8	26.2

Summary

Treatments	1 - 4	5	6 - 7	8 - 10
pH	6.44 - 7.39	6.40	5.95	4.71 - 5.63
Number clean	52	33	71	109
Number scabby	95	26	36	43
Total number	147	59	107	152
Per cent scabby	64.6	44.1	33.6	28.3

scabby tubers. While the results are not reported in the table, grading of tubers showed an increase in the severity of scab as well as an increase in the percentage of diseased tubers as the alkalinity was in-

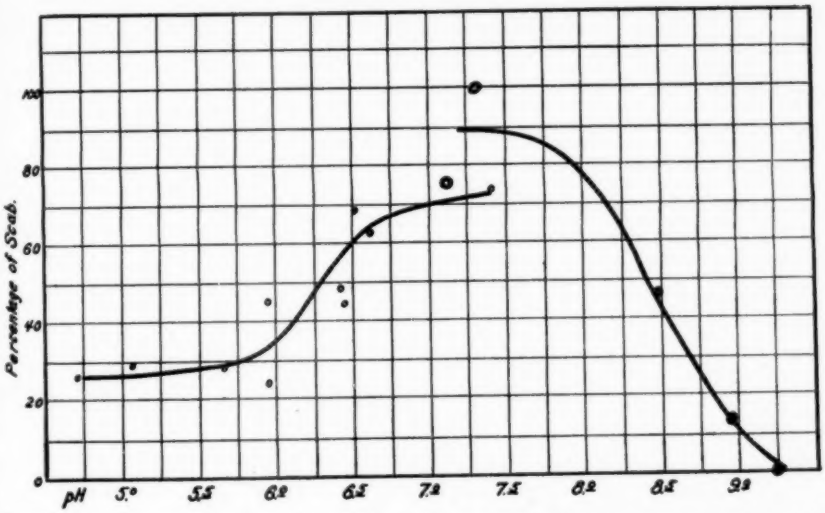

FIGURE 2.—*Curves showing the relation of average pH to percentage of scabby tubers for the results of experiments reported in tables 2 and 3. Curve from pH 4.7 to 7.4 from table 2. Curve pH 7.2 to 9.3 from table 3.*

creased. If these percentages are plotted against pH (figure 2) the general trend of the curve is very similar to that part of the curve, covering the same pH range shown in the survey cited above and in general seems to confirm the survey observations.

In the alkaline range

Since the extreme alkaline end of the range had not been reached in the previous experiment, two additional experiments were conducted in which the amount of lime added was doubled from one treatment to the next and modifications were carried on the alkaline side beyond the range of the growth of potatoes. Dunkirk fine sandy loam soil unsterilized, with an initial pH of approximately 7.2 was used in both experiments and the plants were grown at about 75° F. In these highly alkaline soils a glass electrode was used for pH readings.

In order to be sure that plenty of inoculum was present, in the first experiment, scab strain (T-16) was used as an inoculum and the treatments were as follows:

1. Soil and sterile wheat only.
2. Soil and inoculum only.
3. " " " plus 30 gr. Ca $(OH)_2$
4. " " " " 60 gr. "
5. " " " " 120 gr. "
6. " " " " 240 gr. "
7. " " " " 480 gr. "

With the exception of treatment 1, two crops were grown, and the combined results are shown in table 3, experiment 1, from which it can be seen that as the pH increased from 7.2 to 9.2 the amount and the severity of the disease decreased. In treatment 6 (pH 9.4) of this series, growth was very poor and few potatoes were harvested while in treatment 7 (pH 9.6) no growth was obtained.

The soil used in the second experiment of this series had been inoculated with nine strains of Actinomyces and was selected as causing the most scabby potatoes from a series of pathogenicity tests. The previous crops in this soil had consisted of 87 tubers with severe scab, 55 with moderate scab, 18 with slight scab and 7 clean.

This soil was mixed and modified as follows:

1. Infested soil only.
2. " " plus 30 gr. $Ca(OH)_2$
3. " " " 60 gr. "
4. " " " 120 gr. "

Referring to the results in table 3, experiment h, it will be noted that in treatment 1, with infected soil only, all the potatoes grown in the two crops were scabby: treatment 2, with an average pH of 8.5, 14 tubers or 47 per cent were clean; and in treatment 3, with an average pH 9.0, 10 tubers or 91 per cent were clean; treatment 4, permitted no growth. These results were obtained using a soil which had given previously only 4 per cent clean tubers.

The results of these two heavily-limed series have been combined, table 3, to show the result of increasing the alkalinity in this rather extreme range. There was a reduction in the amount of scab in this series before a degree of alkalinity was reached which inhibited the growth of potatoes. However, higher pH values were required in these tests to inhibit scab infection than were required under the conditions of the survey. Relatively high and probably impracticable amounts of lime were required to bring about this change. However, these tests were conducted under greenhouse conditions very favorable for scab: the soil was heavily infested with the scab organism, the temperature was high, and the potatoes were grown in well drained pots that were well aerated and in which the soil moisture did not remain high.

TABLE 3.—*Classification of the tubers in the lime concentration experiments*

Experiment I

Treatment	1 Wheat Only	2 Inoculum Only	3 30 Grams $Ca(OH)_2$	4 60 Grams $Ca(OH)_2$	5 120 Grams $Ca(OH)_2$	6 240 Grams $Ca(OH)_2$	7 480 Grams $Ca(OH)_2$
pH	7.2	7.2	8.5	8.8	9.2	9.4	9.6
Number of tubers:							
Clean	6	0	14	22	15	6	0
Scabby slight	9	0	6	3	0	0	0
moderate	9	5	2	1	0	0	0
severe	0	6	1	0	0	0	0

Experiment II

Treatment	1 Check No Lime	2 30 Grams $Ca(OH)_2$	3 60 Grams $Ca(OH)_2$	4 120 Grams $Ca(OH)_2$
pH	7.3	8.5	9.0	9.3
Number of tubers:				
Clean	0	14	10	0
Scabby: slight	5	10	1	0
moderate	11	6	0	0
severe	6	0	0	0

Summary of Lime Experiments—(Experiments I and II combined)

Treatment	1 Wheat Only	2 Inoculum Only	3 30 Grams $Ca(OH)_2$	4 60 Grams $Ca(OH)_2$	5 120 Grams $Ca(OH)_2$	6 240 Grams $Ca(OH)_2$	7 480 Grams $Ca(OH)_2$
pH	7.2	7.2–7.3	8.4–8.5	8.8–9.0	9.2–9.3	9.4	9.6
Number of tubers:							
Clean	6	0	28	32	15	6	0
Scabby: slight	9	5	16	4	0	0	0
moderate	9	16	8	1	0	0	0
severe	0	12	1	0	0	0	0
Per cent scabby	75	100	47	14	0	0	0

Conclusions

In these rather simple exploratory tests, no reason was found for believing that lime has any effect on potato scab other than through its effect on the alkalinity of the soil.

The general relation of acidity of the soil to scab was similar to that previously reported from a field survey.

The amount of scab was reduced by extremely heavy applications of lime giving pH values of the soil (about 9.0) higher than those found on the survey (8.0-8.3) where scab was not troublesome.

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THE EFFECT OF TEMPERATURE, PHOTOPERIOD AND NITROGEN LEVEL UPON TUBERIZATION IN THE POTATO

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There is a general agreement that relatively low growing temperatures (59-65° F.) are essential for maximum yields of potato tubers. Bushnell found that the quantity of carbohydrates utilized in respiration by the potato plant increased with the temperature so that the surplus available for tuberization was reduced until at a temperature of 80° F. and higher none at all was available and tubers were not formed. Gar-

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[2]This paper, which was read before the joint session of the American Society for Horticultural Science and the American Society of Plant Physiologists, is based in part on data published in Nebr. Agr. Res. Bul. 75—and in part on data that will be published more fully at an early date.

ner and Allard reported good tuber production with a 10 hour day in the relatively high summer temperatures at Washington, but little with a 14-15 hour day, none at all with an 18 hour day, and also very little with a 5 hour day (the latter, because of reduced leaf area). In sand culture and fertilizer studies the external nitrogen supply has been found to be an important factor in tuber production. The increased yields of tubers secured by means of straw mulches in warm regions, are believed to be due to the reduced nitrate content of the soil in combination with the lower soil temperature.

There is as yet little in the literature to enable one to determine the relative significance of each of these factors at various stages of the development of the plant or when they occur in various combinations. Arthur, and later Beaumont and Weaver reported that with days of a given length tuberization was increased by lowering the temperature. Beaumont and Weaver secured maximum tuberization in a 15 hour day at 58° F. Razumov secured a greater weight of tubers when long days (19-15 hour) occurred early and short days (10 hours) late in the life of the plant than when days were continually long or short. When short days occurred early and long ones later the tuber yield was greater than with continually long or short days but less than when long days were followed by short ones.

In the studies being reported in this paper an endeavor was made to determine the effect upon the time, rate and extent of tuberization when temperature, photoperiod and nitrogen level were constant or when one or more of these factors was altered. A medium early tuber line strain of the Triumph variety was used. All plants were grown with nutrient solutions in sand in 10 inch clay pots. The plants received the full quota of N,—two parts being applied as calcium nitrate and one part as ammonium sulphate.

Effect of Photoperiod and Temperature

Tuberization was hastened by short photoperiods, low constant temperatures or diurnal variations in temperature and by reducing the amount of nitrogen supplied in the nutrient solution or by withholding it entirely. It was further hastened or delayed by combining some of these variables.

Tuberization occurred within the first 24 days after emergence when the days were 10 hours long and the temperature was 62° F., but with an 18 hour day it was delayed until the 45th day. As the temperature was raised, tuberization was delayed and did not occur at all with the longer days (15 hours) when the temperature was 80° F.

When photoperiods were 9½, 15 and 18 hours long, if the daily temperature of the greenhouse averaged 62° F. but was permitted to vary through a diurnal range of 20—25° F., (as it frequently does out of doors,) tuberization occurred in 17, 26 and 32 days as contrasted with 24, 35, and 45 days when the daily range was less than 5° F. Similarly in one series at 80—85° F., with a daily range of about 25° F., tubers were set during the first 15 days and a good crop was produced with a 10½ hour day but in another series with a range of about only 4° F., tubers were not set until the 28th day.

With the 10-12 hour day a greater weight of tubers was produced to a given early date than with longer days, but because of their greater leaf area and longer life the long day plants eventually produced a much greater weight of tubers. With a six hour day, plants were small and short-lived and the photosynthetic period was so short that the tuber yields were high for only a few weeks and the total final yield was very low. With short days the few short stolons were limited almost entirely to primary stolons and the tubers were few and large. With longer days, long primary stolons and numerous branch and lateral stolons were formed as well as a large number of tubers which seldom were very large. As the day length increased, the ratio of dry weight of tubers to tops decreased as did also the percentage of dry matter in the tubers.

When the diurnal temperature fluctuated widely from a mean of 62° F. the stolon growth was less and plants were shorter lived than when the temperature varied less, but early production and possibly total production of tubers were greater as were also the ratio of tubers to tops and percentage of dry weight in tubers.

At the higher temperature plants were more etiolated, leaves were smaller and more poorly developed, and the total yield of tubers was very much le s than with comparable treatment at lower temperatures. Likewise the percentage of dry matter in the tubers was less as was also the tuber/top ratio.

Effect of Manipulation of the External Nitrogen Supply

Withholding N from the nutrient solution, or supplying only 10 per cent of the complete amount, delayed tuberization only for a short period but did cause a great reduction in the number and weight of tubers. The reduction in weight was roughly proportional to the reduction in the N supply. Tuber setting seemed to be hastened more by an N deficiency when plants were growing under conditions least favorable for tuberization, such as long cool or short hot days, than under more favorable conditions such as short cool days.

Withholding N from vigorously vegetative but non-tuberous plants exposed to long warm days resulted in an immediate setting of tubers. The production of tubers by these plants was greater for a number of days until the N starvation weakened the plants and thereby reduced the rate of carbohydrate storage. When days were 15 hours long and the temperature averaged over 85° F., the tuber production of these N deficient plants continued to increase, because of the ability of their leaves, to endure heat whereas with + N plants it decreased due to resorption of contents. When N was withheld from less vegetative plants, which were actively producing tubers (temperature 60° F., days 10-12 hours long), there was little or no acceleration of tuber growth. In fact with the most tuberous plants a reduction in yield was found to have occurred within the first 19 days that N was withheld. This occurred with 10-11 hour days at both 60° F. and 82° F.

When N was again supplied to certain of these plants, after having been withheld for 19 to 29 days, where conditions were very favorable for vegetative growth, tuberization was retarded for a brief period and then accelerated. If conditions were very favorable for tuberization and unfavorable for vegetative growth, increased tuberization immediately followed the resumption of the supplying of N.

Withholding nitrogen from the nutrient solution did not bring about tuberization when the temperature averaged over 85° F. and days were between 14 and 15 hours long but tubers were produced in abundance at this temperature when the day length was reduced to 10½ hours. With the latter day length the greatest weight of tubers was produced with a constant N supply.

Good crops of tubers were produced by the + nitrogen plants when exposed to long warm days (15 hrs. 85° F.) in the early growth stages and progressively shorter and cooler days later. When both day length and temperature increased during the life of the plant (from 14 hrs. 72° F. to 15 hrs. 92° F.) tubers that had been set early were resorbed and tuber weight decreased as the plant became older. When days which were relatively short and cool in the early growth stages (10½ hrs. 70° F.) became still shorter and cooler (9¼ hrs. 60° F.) tuberization started very early (during first 15 days after emergence), but the total tuber production was less than when the day length increased from 9½ to 12 or 13 hours at a mean temperature of 62° F. The plants of the latter series had larger and longer-lived tops.

Effect of Environment on Composition of Plant

Tubers from plants from which N had been withheld at any time always had a higher percentage of dry matter than those from + N plants except when the tops of N deficient plants were dying rapidly while those of + N plants were still growing. Supplying N to starved plants when days were long and warm resulted in an actual decrease in the percentage of dry matter in the tubers. When days were short and cool the dry matter percentage of the tubers of + N plants increased with age but less so than those on N deficient plants. The tubers on N starved plants generally had a higher percentage of the more concentrated carbohydrates but a lower percentage of reducing sugars and the percentage of both inorganic and organic N was distinctly lower than in + N plants.

The amount of assimilated N found in the plant increased constantly and at about the same rate as did the total dry weight of the plants. When plants were young most of the assimilated N was found in the leaves but after tubers began to develop a constantly increasing percentage of the N that was being assimilated went into the tubers. This continued to the point where the accumulation of assimilated N in the tubers was greater than the increase in the entire plant, thus indicating that translocation of N was occurring. Such translocation occurred earlier and at an accelerated rate under N starvation conditions. In other words, when a nitrogen deficiency occurred most of the nitrogen that was available or could be proteolyzed and translocated, eventually was found in the tubers.

With plants that were vegetative to a medium or extensive degree the underground stems and tubers contained little or no starch that could be detected by ordinary microchemical methods. When nitrogen was withheld from such plants starch accumulated very rapidly in all underground parts and remained there until tubers with sufficient storage capacity were formed to remove it, or the amount of reserve carbohydrates was reduced because leaves deteriorated. When N was supplied to plants, in which much starch had accumulated, under environmental conditions favorable for vegetative growth, the starch soon disappeared either into the tubers or into the top where it was used in building new leaves. When environmental conditions were more favorable for carbohydrate accumulation than for vegetative growth a slightly different condition was found to occur. This was observed with plants that were actively producing tubers at a temperature of 60-62° F. with days increasing from 11 to 13 hours. When N was supplied to some of these plants which were showing advanced

symptoms of N deficiency (starved 19 days) the starch content of the underground stems increased during the first two to four days. With the rapidly improved condition of the leaves the amount of reserve carbohydrates was somewhat in excess of what the storage system of the plant could accommodate until, after about 7 or 8 more days, this carbohydrate accumulation in the stems was taken up by the tubers in which growth had also been accelerated and then stems were almost free from starch. During this time the starch accumulation in the control N deficient plants vanished almost completely because the tubers could readily absorb the small amounts of carbohydrate material manufactured by the senile leaves. On the other hand, in tuber-producing plants from which N was withheld after the 39th day, starch accumulated very slowly; not becoming abundant until approximately 14 days later. In the case of these plants the tubers were more vegetative (less dry matter, more N) at the time the change was made, consequently their cells were capable of storing a considerable amount of carbohydrates. But as N was less easily available the growth rate of these tubers was retarded and they were unable to assimilate carbohydrates at the former rate; consequently starch accumulated in the stem. However, this surplus was absorbed by the tubers within the next week or ten days since the amount manufactured by the leaves was greatly reduced, as they had used up their reserve N or had lost it to the tubers and were consequently degenerating rapidly.

A reduction in the amount of nitrogen supplied or assimilated always decreased the number of tubers, the number and length of stolons and partially or entirely prevented the development of lateral or branch stolons. When the nitrogen situation was altered during the middle or latter part of the life of the plant by either altering the N content in the solution or by changing the environment, stolon growth was altered little if any but the number and size of tubers was influenced.

Discussion

Whenever carbohydrates were manufactured in excess of the capacity of the plant to build new tissues or beyond the respiration requirements, they accumulated in the tubers, after a transitory period of storage in leaves, stems and stolons. Such accumulation has been found to occur (a) when days are shortened; (b) when the temperature is reduced; (c) when the external nitrogen supply is reduced; or (d) when any of these things occur in combination. Probably all of these are really carbohydrate-nitrogen effects. When

nitrogen is being assimilated into N compounds necessary for new growth and carbohydrates are also used up in this process and by respiration, as rapidly as they are manufactured; tubers do not form. But when nitrogen cannot be assimilated,—due to either short days, low temperature or an inadequate external supply of inorganic nitrogen, carbohydrates accumulate beyond the needs of the plant and tubers form.

Thus a series of conditions may be pictured as follows:

First, the plants grown during short and cool days, on which tuberization occurs very early but the number of tubers per plant is low because of the small size of the plants.

Secondly, plants which produce maximum crops of tubers. These are grown with somewhat longer or warmer days so that the leaf area is increased but not sufficiently to cause great demands upon carbohydrates for growth and respiration. Days may be quite long if the temperature is low and the temperature may be increased considerably if the days are short.

Thirdly, plants with still greater vegetative growth including very extensive stolon production, but tuber production decreasing or not occurring at all. Such plants are produced when temperature or day length are increased still further.

Fourthly, the vegetative growth is less extensive and neither stolons nor tubers are formed when either temperature or day length is increased still further. Growth is inhibited because of the large amount of carbohydrates required for respiration.

With all these types of plants tuberization is hastened by subjecting the plants to a nitrogen shortage but the total crop of tubers is reduced. This is most effective when conditions are most favorable for vegetative growth and least effective when most favorable for early tuberization.

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SECTIONAL NOTES

COLORADO

It is estimated that 186,000 bushels of seed potatoes will be certified from 1300 acres. This is less than half of last year's production. (Oct. 10).—George Beach.

KENTUCKY

Eighty-nine acres, all Cobblers, passed the second field inspection. Our splendid crop prospects were reduced by extraordinarily hot and dry weather, particularly in the Louisville district, where we estimate an average of 135 bushels per acre. In Lexington, more rain fell and the average acre-yield is 145 bushels, graded U. S. 1. We had our first frost October 2, 13 days earlier than the average year. It was spotted over the state, but killed nearly all the potatoes north of Lexington. Harvesting has begun. The potatoes planted after July 20 were remarkably clean, but those planted prior to that date show 10 to 30 per cent mild scab. It appears that climatic conditions are the most important factors in the occurrence of potato scab in Kentucky. (Oct. 9).—John S. Gardner.

MAINE

Harvesting is nearly completed in the central section of the potato district. Another week will see the completion of harvesting throughout the state. Yields on early varieties have been light, but since the late varieties received the benefit of rains in September the yields were materially improved. It is probable that the average yield of Green Mountains will not exceed three-quarters that of last year. The quality is excellent, size medium, and the type good. Some "cracking" or splitting of the tubers in Green Mountains, has been in evidence. The amount of damage from that source is difficult to determine at present, although the injury has been exaggerated in potato conversations. This "cracking" has probably resulted from partial maturity in August, followed by rapid, late season growth.

Growers are now starting on fall work, plowing, picking rocks, etc. With so little money available, the amount of work done is kept at a minimum. A striking commentary of present conditions is the general absence of tractor plowing, and the use of more horses than has been the case for several years.

During the past six days, October 7th to 12th inclusive, the f. o. b. price, sacked per hundredweight, has advanced 25 cents. The government report, in some measure, was responsible for this, but the advance was really a long delayed one that should have occurred before. Export of a considerable volume of potatoes by the sales organizations handling Production Credit Association potatoes was the deciding factor starting a price advance, because of relieving the normal markets at a critical time. This illustrates, anew, the value of concentrated sales effort.

There is little seed being bought, as yet. Buyers have been taken unawares by the recent advances, and seem reluctant to cover on the present basis. The statistical position of the potato market is favorable for further advances as far as Maine is concerned, and both growers and dealers are holding firm. There is some ground for believing that the government estimate for October 1st, will be reduced because yields have not improved during September and October as much as was anticipated.

The delegation of Aroostook growers and shippers, who attended the hearings in Washington October 3rd and 4th, came away with the conviction that a great majority of potato growers over the entire country favored control legislation, and that they were ready to give the present legislation a fair trial. Apparently, it is difficult to secure voluntary agreements to reduce production. Something compulsory seems to be the only answer to a regulated market. (Oct.12).—Frank W. Hussey.

MASSACHUSETTS

The harvesting of the potato crop is progressing normally. The quality is average with little or no rot except in isolated cases. Yields are normal although somewhat lower than last year. Farm prices continue at approximately 80 to 90 cents a hundred, wholesale lots. A normal movement of potatoes to market is in evidence with no disposition on the part of the growers to store more than the usual amounts. (Oct. 11.)—Ralph W. Donaldson.

MICHIGAN

Our certified seed potato acreage this year totals about 2000, compared with 2937 acres for 1934. It is estimated that our rejections on field inspection will be about 10 per cent. Last year our average yields per acre from certified fields were 229 bushels and

the state average was 128. Our season this year has not been so favorable for high yields. Considerable hot weather early in the season and the fact that it was comparatively dry in September, resulted in a rather light set and low yield. Our certified fields will therefore, average about 160 bushels per acre. Last year we had approximately 300,000 bushels of certified seed for sale and this year it will probably be less than 200,000.

Of the 2000 acres listed, approximately 1500 acres are of the Russet Rural variety. Green Mountains and Katahdins comprise about 200 acres each and the Irish Cobbler about 160. All the Green Mountain seed is produced in the Upper Peninsula.

Generally, the quality of the crop is very good, though in a few sections there will be a heavy loss on account of off-type and hollow heart. The hollow heart condition is more prevalent in the rural types.

In the field inspection work the biggest difficulty this year was from injury caused by potato bugs and early blight. Both troubles seemed especially difficult to combat this season. As a rule there were fewer rejections because of mosaic and other virous diseases, although the spindle tuber disease was conspicuous in some fields of Katahdins.

Harvesting in the Upper Peninsula has been completed and is nearly finished in the northern part of the lower peninsula. However, in the central and southern portions it is still under way. A heavy freeze on October 5, no doubt, did some damage to fields where the potatoes were setting close to the surface of the soil. (Oct. 9).—H. C. Moore.

MINNESOTA

According to the latest reports, this year's potato crop is the largest for the state since 1928 when the final estimate placed the total production at 38,940,000 bushels.

The September estimate of 32,064,000 bushels is approximately nine million bushels more than were produced in 1934. The fact that there was practically no difference in the total acreage between 1935 and 1934, with a nine-million-bushel increase in the crop this year, is a fair indication that growing conditions were better than last year. Although hot and dry weather prevailed during the last three weeks in July, it occurred too late to injure the crop in the sand land area to the extent which that region suffered in 1934,

when the hot spell was at its worst during the period of tuber formation.

In the Red River Valley and in the Arrowhead sections, rain was more plentiful and fell at opportune times. As a matter of fact, rainfall in certain localities was excessive so that low spots in some fields were drowned out.

Fusarium wilt was more prevalent this year than it has been for many years, particularly on the lighter types of soil.

Following is a summary of the seed potato certification work for this season:

Variety	Total Acreage Inspected	Acreage Rejected or Withdrawn	Acreage Passed
Bliss Triumph	1171.0	65.5	1645.5
Irish Cobbler	5172.0	768.0	4404.0
Early Ohio	1302.75	97.0	1205.75
Warba	436.23	48.63	387.6
Chippewa	29.15	7.6	21.55
Green Mountain	37.96	0.0	37.96
Russet Burbank	23.75	2.5	21.25
White Gold	17.5	4.0	13.5
Golden	.32	0.0	.32
Katahdin	45.36	25.61	19.75
Rural New Yorker ...	10.0	0.0	10.0
Spaulding Rose	10.0	0.0	10.0
	8796.02	1018.84	7777.18

There is a considerable increase in acreage of the early varieties inspected and certified over that of 1934. The growers are now in the midst of harvesting; and from the fields observed the quality of the stock is good. (Oct. 7).—A. G. Tolaas.

NEBRASKA

The late or western Nebraska potato crop which is being harvested is in better condition than has been the case for a number of years. A shortage of irrigation water in most cases prevented any irrigation after late August or early September and there has been no fall rain of any kind. The Triumph potatoes are more mature than usual and are not cracking or feathering very much if handled with reasonable care. The weather has been ideal for harvesting the crop; clear and bright most of the time and slightly warmer than usual. The cool nights have enabled farmers to maintain desirable storage temperatures. The yields are generally high and the quality very good. There is relatively little

scab. A few fields are not being harvested because of depredations by psyllids.

The dry land crop was, in most cases, grown without rain since planting, except for one rain in early September of 0.5 to 1.1 inches, which moistened the soil to a depth of 4 to 6 inches. In spite of these dry conditions the plants remained green until harvest time and produced what might be considered a normal crop of very good quality. This good yield is evidently due to the potato roots having gone to considerable depth for moisture. Soil samples taken to a depth of 5 feet in late August showed that plants had withdrawn considerable moisture from the fourth and fifth feet, on the basis of comparison with soil moisture determined in the same soils in early July when plants were emerging.

Market conditions are not satisfactory. Many potatoes from the early region in central Nebraska are still being sold in competition with the late crop. A number of new cellars have been built in the western irrigation regions and practically all cellars are filled beyond the desired storage capacity. (Oct. 11).—H. O. Werner.

NEW YORK

Observations would seem to indicate a very low yield. Potatoes in the southern tier counties never seemed to recover from the waterlogged condition of the soil which took place in connection with the flood on July 6. Even outside the flooded area, however, the yield seems to be low. In spite of the fact that this condition seems to be general throughout the central part of the state, some of the better growers are getting excellent yields. It would seem that heavy fertilization, accompanied by better spraying, was quite worthwhile this year. The average yield of certified seed will also be somewhat low. The acreage is the lowest since 1927 and the total production will probably be the lowest since that year. The acreage certified by varieties and the present estimated production is given in the following table:

Variety	Acreage	Yield, Bu.
Green Mountain	428	100,000
Smooth Rural	395	100,000
Russet Rural	346	70,000
Irish Cobbler	305	60,000
Miscellaneous	62	15,000
Total	1,536	345,000

A new factor has been introduced into New York certification this year. A sample from each of the certified fields will be tested in Florida during the winter. The results of this test will be taken into consideration in certifying lots of seed after the results of the tests become available in March. Late blight has been present quite generally in the state, but does not seem to have done a great deal of damage. (Oct. 9).—K. H. Fernow.

The first killing frost of the season was quite general over New York early this week. The results will be to start potato harvest on a gradual scale where growers have previously held off to allow the crop to mature. Late rains have kept the crop growing to the present time. Because of frequent rains late in September, blight is quite general in western New York.

Yields are reported to be running light in the southern tier counties of western New York where poor stands, flood damage, and weedy fields were the rule. Light yields are also reported through central New York, although digging has just begun. Long Island growers have delayed digging hoping for improvement in the market. The October report for New York should be reduced below that for September, one reason being that the September report did not properly discount the damage to the crop which occurred during July and August.

The drought and heat of late July and August followed by the September rains have resulted in mis-shaped tubers, hollow heart, second growth and growth-cracked tubers. There appears to be much less scab than usual, probably because of abnormal rainfall. Although the crop has been reduced in western New York because of blight, weather conditions for the next three weeks will determine the amount of blight rot. (Oct. 10).—E. V. Hardenburg.

NORTH DAKOTA

Ten thousand, eight hundred and fifty-five acres of potatoes were certified this year. Last year the acreage was 10,534, with a total production of 628,310 bushels.

While the acreage certified is approximately the same, there will be many more bushels certified this year. Last year our state had very low yields per acre because of the heat and drought. This year we have had a rather normal season and will have approximately 1,000,000 bushels of certified potatoes. The final figures cannot be computed accurately at present, since our potato growers are still in the midst of their digging operations.

There was a larger acreage entered for certification this year than last, but, due to changes in our rules governing certification, we have eliminated a number of fields. As the result of this we have increased the quality considerably, and improved the seed value of the stock which will be certified. (Oct. 12).—E. M. Gillig.

PENNSYLVANIA

The field inspections of certified seed have been completed and prospects for a crop of Pennsylvania-grown seed are better than average. Last year we grew approximately a quarter of a million bushels of certified seed potatoes in Pennsylvania. Present prospects indicate that we may expect about sixty per cent of last year's production which will be close to 150,000 bushels. A certified seed crop of this size would still be considerably about the average supply available during the past five years.

The approximate acreage certified this year compared with the acres certified last year is as follows:

Variety	Acres Certified 1934	Acres Certified 1935
Russet Rural	396.0	323.5
White Rural	165.25	104.5
Cobbler	74.0	93.5
Green Mountain	0.5	0.0
Katahdin	0.0	4.5
Blue Victor	0.0	3.0
	635.25	529.0

Growing conditions were quite variable throughout the state. In some sections the dry weather reduced the crop considerably; in others, excessive and continuous rains interfered with normal growth and created ideal conditions for late blight infection. In still other sections, excessive heat caused many fields to mature earlier than usual with the result that the yields will be reduced considerably.

Growers who have already started digging operations report that the tubers range from small to medium in size, with very little second growth. With a crop of medium-sized tubers, seed growers will experience less difficulty in meeting the grade requirements for certified seed. The demand for seed during the past several years has shown a definite trend toward medium to small-sized tubers. Such seed stock will cut more economically than larger-sized tubers.

This year we have available, for the first time, a small supply of certified seed of the new Katahdin potato. A considerable volume of certified seed of the new Nittany Cobbler, developed by Doctor Nixon, is also available. This potato has been giving very good results when compared with the Irish Cobbler. Seed growers who have stock of this variety report that they have already sold a considerable amount of their crop. (Oct. 2).—K. W. Lauer.

VERMONT

The total acreage certified was 564 11/20 divided as follows: Green Mountains 436½; Irish Cobblers 113¼; Katahdins 5⅘; Spaulding Rose 7; Others 2. This compares with a total of 616⅞ for 1934.

The yield per acre will be much below that of last year. It appears doubtful if Green Mountains will average over 250 bushels to the acre in certified fields. Cobblers appear to have yielded proportionately better than Green Mountains this year and one grower of 30 acres reports more than a 300 bushel yield to the acre. Cobblers will not average this, however. There will be a few over-size tubers and the shape as a whole appears to be generally good.

Except for some of the especially dry sections of the state, Green Mountains continued fairly green throughout September and the first killing frost came October 7th in most sections.

Late blight rot has shown up in a few fields but will not be of general importance. White grub injury is more serious than any other one trouble. In some cases fifty to seventy per cent of the tubers have been injured.

The season's field inspection reports revealed no particularly important trends of disease spread. Mosaic counts, particularly, were lower than might have been expected in a moist year following two very dry years with their attendant difficulties in disease determination. (Oct. 10).—H. L. Bailey.

WASHINGTON

There were 673 acres of seed potatoes certified in 1934, and in 1935, only 439 acres passed all field inspections. This will mean, less bushels of certified seed in the State of Washington, approximately one-third less, for the present season, than for last year.

WYOMING

Favorable weather conditions in the spring resulted in a good stand of potatoes. However, the drought and hot weather during July and August reduced the prospects for a large crop. Nevertheless, the weather conditions during September were quite favorable and approximately an average crop will be harvested. Wyoming will probably have from 200,000 to 250,000 bushels of certified seed potatoes to place on the market this year. (Oct. 11).—Wm. A. Riedl.

PRINCE EDWARD ISLAND

	Acres	Average Yield Field Run. Bus.	Bus. Marketable* No. 1	Small
Irish Cobblers	8,775	125	60	40
Green Mountains ...	3,312	200	120	30

*Due allowance must be made for rejections in the bins because of scab, etc.; also for growers who will grade for table stock markets.

Cobblers in Prince Edward Island suffered severely from drought during July and August. The crop is spotty, some growers having very low yields (100 bushels per acre), whereas others have 200 to 250. These latter are in the minority. The type is good and the skin clean. There will be a considerable quantity of small size certified seed (1½ to 3 ozs.) available.

Green Mountains were not so adversely affected by the drought and will yield approximately 200 bushels per acre. Cobblers are practically harvested and the Mountains are now being dug. Very little blight rot has been reported to date. (Oct. 12).—S. G. Peppin.

THE PRICE SITUATION

The following report was released on October 15 by the Bureau of Agricultural Economics of the United States Department of Agriculture: Frost damage and other unfavorable weather conditions in some states in September reduced the prospective production of late potatoes. The total estimated crop for 1935 is down close to the recent 5-year average. Prices registered slight seasonal declines in some sections, but the market in general held fairly steady. Any further reductions of crop prospects may tend to push prices to higher levels. Shipments continued lighter than

at the same time last year, although car-lot movement was increasing rapidly as digging progressed.

Unfavorable growing conditions in September reduced potato crop prospects, particularly in New York and Michigan. Other Eastern and Central States also suffered a set-back, but weather was generally favorable for potatoes in the Western States. The 3 eastern surplus late-potato States now expect 83,850,000 bushels, or 31 per cent less than last year and 10 per cent below the 5-year average for 1928-1932. The 5 Central Surplus States recorded a decline of nearly 4,000,000 bushels, making the October estimate for this group 97,369,000 bushels, or only 1 per cent above their 1934 crop and only 9 per cent above average. The 10 Western Surplus States held around 72,000,000 bushels, which is one third more than they had last season and 3 per cent greater than their 5-year average. Production prospects in the 12 Other Late States declined to 40,600,000 bushels, or only 2 per cent above their 1934 crop and 6 per cent above average.

The 30 late-potato States combined now expect about 294,000,000 bushels, a net decrease of 6 per cent from last season and only 1 per cent above average. The total United States crop for 1935 is now forecast at approximately 366,000,000 bushels from an average yield of 112.4 bushels per acre. This total is 7,000,000 bushels below the September forecast, about 19,000,000 bushels less than the 1934 crop, and only 2,600,000 bushels above average.

Shipments by rail and boat during late September and early October averaged around 3,000 cars per week, compared with 3,700 a year ago, but the mid-October output was beginning to reach 4,500 cars per week. By October 5 the surplus late-potato States had shipped 20,000 cars, as against 26,135 to the same time last season. The only important States to show a heavier movement than to early October of last year were North Dakota, Minnesota, Colorado, and California.

The general jobbing range of eastern potatoes in the New York l. c. l. market recently was around 93 cents per 100-pound sack, compared with an average of 96 cents a month ago and about 92 cents in early October 1934. Round Whites in the Chicago carlot market recently ranged from 70 to 88 cents per 100-pound sack, or only slightly below the level of early September. At the same time last season the Chicago average was 98 cents. Idaho Russet Burbanks held around $1.60 in Chicago, the same as a year ago. Idaho's production is about the same as in 1934, the large increase

this season being in other Western States, particularly Colorado and Nebraska.

The f. o. b. market in northern Maine was holding steady on Green Mountains around 50 cents per 100 pounds sacked, or 5 cents above the level of early October 1934, when Maine had a record-breaking crop. At Waupaca, Wisconsin, shippers were receiving about 57 cents per sack of Round Whites, compared with 75 cents a month ago and 65 cents at this time last season. The Idaho cash-track market on Russet Burbanks held fairly steady at 62 cents, with Rurals at 35 cents, but was slightly lower than in early October of last year. The main shipping season in New Jersey closed at 75 cents per 100-pound sack of Cobblers, about 25 cents below the early September level and 10 cents lower than the f. o. b. price at the end of the 1934 season in that State. Shippers on Long Island recently were getting 80 cents per sack, Cobblers being as low as 72 cents and Green Mountains as high as 90 cents.

The United States average price to growers of potatoes on September 15 was 48.4 cents per bushel, compared with 50.7 cents the month before, 62.8 cents in September 1934, and a 5-year (1909-1913) September average of 74.4 cents. The recent report on returns to growers ranged from a low point of 30 cents per bushel in Maine to a high of 90 cents per bushel in Mississippi. The September 15 parity price for potatoes was 89 cents per bushel.

REVIEW OF LITERATURE

Handling seed potatoes to insure good stands, JOHN BUSHNELL, (*Ohio Agricultural Experiment Station Bimonthly Bulletin, January-February,* 3-6), (1935).

Ways of improving potato stands, (OHIO VEGETABLE GROWERS ASSOCIATION *Proceedings* 20, (1935) *pp.* 56-59). In these two papers the causes of our poor stands in Ohio are itemized. Poor stands are common in June plantings due chiefly to (1) deterioration of seed in storages which cannot be kept cool in Ohio, (2) exposure of freshly-cut seed to wind and sun during the operations of planting. Cut seed exposed to bright sun for two hours on June 22, 1934, was not discolored nor shrivelled at the end of the two hours but was found to be so seriously injured that the stand was only 42 per cent. Small, whole seed from certified fields is strongly advocated for late plantings in Ohio. (See Amer. Potato Jour. 8:3-6, 1931).

Other causes of poor stands are: (1) Drowning of the seed by heavy rains after planting, (2) contact with fertilizer, (3) Rhizoctonia

injury to the sprouts, (4) wireworms, and (5) scab gnat. Scab gnat injury to the seed is probably the most serious of these five causes in Ohio.—THE AUTHOR.

Sensitivity of the potato plant to soil aeration, JOHN BUSHNELL (*Journal American Society Agronomy, 27,* (1935), *pp.* 251-253). In a fertilizer experiment at Wooster, Ohio, on a silt loam soil, wheat and clover have given excellent yields but the potato yields have been far below expectation. By mixing sand in the plowed layer the yields were increased 24 to 74 bushels per acre. As it seemed that the benefits from the sanding might be due to the improved aeration of the soil, a special aerating experiment was conducted on an adjacent field.

Tile lines were laid six inches deep, directly under potato rows, and the lines were left open at both ends so that air could circulate through them. Two rows were prepared with a special perforated tile, each tile having 36 small holes in one side. Two rows had plain drainage tile, and three rows were dug out as if to be tiled and the soil shoveled back without tiling. The potatoes were planted about four inches deep, so that only about an inch of soil intervened between the tile and the bottom of the seed pieces.

An experiment was conducted in 1933 and repeated in 1934. Both seasons were dry during the summer, but with favorable fall rains which were not heavy enough to compact the soil. The average yields were as follows:

Type of tiling	*Yield in* 1933	*Yield in* 1934
None	352.5	330.6
Plain tile	397.6	363.5
Perforated tile	419.1	400.9

The ventilation by means of the perforated tile thus increased the yield about 70 bushels per acre both seasons.

The results show that this silt loam soil, which is an excellent soil for wheat, corn and clover is normally not sufficiently aerated for maximum yields of potatoes. Stated conversely, the potato plant seems to require a more aerated soil than other farm corps.—THE AUTHOR.

Studies of the effect of storage temperature on the propagation value of potato tubers, J. D. HARTMAN (*Cornell University Agricultural Experiment Station Memoir* 168 (1935), *pp.* 1-39). Forty-eight weighed lots of 75 or 100 small tubers were placed in storages held at 50°, 40°, 35° and 32° F. The losses of weight were

greatest from those lots stored at 50°, but were about the same from lots stored at the other temperatures, in spite of the fact that evaporation was considerably less at 32 degrees than at 35 degrees. Bud development and sprout growth in storage were investigated histologically and by microscopic measurement. Rate of sprout development after planting, as indicated by the time of emergence, and the relation between this and yield were also studied quantitatively. From the data obtained in these studies and in experiments on others reported in the literature, it was concluded that storage temperature affects the yielding ability of seed potatoes chiefly by affecting the size of sprout developed. The best sprout is the largest that will not be broken off in the planting operation.

Observations on the inheritance of morphological characteristics in the potato, K. SNELL (*Angewandte Botanik*, 16 *pp.* 425-429. (1934). *No.* 5). The author points out the use of some of the easily recognized characteristics in the identification of potato varieties. The most important are the color and shape of the plant and tubers as well as the hairiness of the plant. Since these characteristics are inherited they are of especial interest also to the student of genetics.

A few cases are cited of hereditary morphological characteristics which have been observed in progenies derived from crosses in which the varieties Centifolia, Jubel and Industrie have been used as parents.

The development of red anthocyanin in the cork layer of the tubers and the related coloring of the root protuberances of the light-sprouts of the cork ring in the inflorescence, and of the midrib of the leaves at the point of insertion of the pinnae, are conspicuous characteristics of Centifolia. The characteristics are also expressed in a large number of varieties which have been obtained by using Centifolia as a parent.

The ability to transmit color is indicated by the color of the light-sprouts. Jubel, which produces red light-sprouts, when crossed with other red-sprout varieties produces chiefly red-sprout progenies. Jubel crossed with Industrie, which appears from the author's statement to transmit purple, produced 5 varieties with red light-sprouts and 5 with purple light-sprouts.

Other characteristics of Jubel which appear in its progeny are the development of lenticels at the base of the light-sprouts and the occurrence of floral abnormalities.

A hereditary morphological characteristic of Industrie is that of leaf concrescence. Of 43 varieties coming from Industrie crosses, at

least 17 show a more or less pronounced occurrence of this characteristic.

No data are available regarding the mode of inheritance of these characteristics as only a few varieties from the different progenies were examined.—C. F. CLARK.

POTATO MEETINGS

November 5-8—North Judson, Indiana. Sixth Annual Truck Crops Show.

December 31 to Jan. 2—Annual Meeting of the Potato Association of America, St. Louis. Official Headquarters, Hotel Jefferson. Meeting place, Room 201, Municipal Auditorium.

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THE CONSUMER AND THE POTATO CONTROL ACT

While many consumers appreciate that the potato growers cannot continue to produce the crop at a loss, there is considerable opposition to the potato control act. Some are willing for the growers to receive returns sufficient to provide a living wage. There are others, however, who seem to feel that any attempt to adjust the potato acreage in order to stabilize the industry and ensure fair returns to the grower is a challenge to their peace and happiness. It appears to be their contention that the cult of rugged individualism includes the right to purchase potatoes when, and as, they choose. There is nothing in the potato control act which will in any way interfere with this sacred right.

Many of the rather vague ideas concerning the provisions of this act are the result of the sketchy, and sometimes inaccurate articles, which have appeared in many publications. Statements such as "it will be a crime for you to drive out to a farm and buy an ordinary sack of potatoes for the cellar bin," can hardly be based on a careful reading of the act.

If the intent of the potato control act had been fully explained, the reaction of the consuming public would probably have been quite different. If the consumer could be assured that the adoption of the act would not result in prohibitive prices much of the present opposition would die out. New Jersey growers who received 50 cents a hundred in August are now receiving $1.60. It should be stressed that the chief purpose of the control act is to avoid these extreme price fluctuations and not to gouge the consumer. Information such as that contained in the article by J. B. Hutson in this issue of the Journal must be brought to the attention of the consumer.

We have the potato control act! Its enforcement must be accomplished in a manner that will not injure the industry. It should be given a fair trial by both grower and consumer. If found to be unfair to either group it will soon be repealed.